

ABSTRACT OF THE DISCLOSURE

A manufacturing method of shallow trench isolation (STI) structure is described.

A substrate is provided, wherein a patterned pad oxide layer and a mask layer are formed on the substrate, and at least a trench is formed in the substrate, wherein the

5 trench is formed by exposing a portion of the pad oxide layer and the mask layer. Then, a liner layer on a surface of the trench is formed. A high density plasma chemical

vapor deposition (HDP-CVD) process is performed to form an isolation layer on the substrate and over the trench, wherein the trench is at least filled with the isolation layer.

The HDP-CVD process includes a first stage process and a second stage process. The

10 bias power of the second stage process is larger than the bias power of the first stage process. Thereafter, the isolation layer over the trench, the mask layer and the pad oxide layer are removed sequentially.